

Remarks

The Applicants note with appreciation the courtesy extended by the Examiner and the Supervisory Primary Examiner in extending an interview on October 12, 2006. The Applicants described the differences between screen printing, multiple-pass printing and single-pass printing. The Applicants also showed a plasma display substrate formed by the multiple pass method and compared it to a plasma display base substrate formed by the single pass method. The Applicants' demonstration showed the "striping" effect present on the multi-pass base substrate that was not present on the single pass substrate. The "striping" effect is caused by inherent imperfections in the paste application process, but were discovered by the Applicants to only be observed due to the cyclic nature of the multi-pass method relative to the single-pass method.

The Applicants have amended the Specification in various locations to place it into more contemporary form. No substantive changes have been made.

The Applicants acknowledge the rejection of Claims 147 and 148 under 35 U.S.C. §112. The Applicants also note with appreciation the Examiner's helpful comments concerning the language at issue.

The Applicants have amended Claims 147 and 148 to address the rejection. For example, Claim 147 now recites a first detector for detecting positions of the outlet holes. Support may be found in original Claim 51 on Page 87, last line through Page 88, first line. Claim 147 also now recites a second detector for detecting positions of the barrier ribs or the spaces between the barrier ribs. Support may be found in original Claim 51 on Page 88, Lines 1 – 3. There is also a third detector for detecting positions of the top ends of the barrier ribs of the base substrate. Support may be found in original Claim 51 on Page 88 at Lines 4 – 5. Finally, Claim 147 now recites a fourth detector for detecting position of the tips of the outlet holes. Support may be

found in original Claim 51 on Page 88 at Lines 5 – 7.

Claim 148 now recites a controller for keeping the tips of the outward holes of the predetermined distance in parallel to the top ends of the barrier ribs of the base substrate. Support may be found in original Claim 51 on Page 88 at Lines 14 – 15. Withdrawal of the rejection of Claims 147 and 148 is respectfully requested.

The Applicants have also amended a number of the other claims to place them into better condition for allowance. For example, Claim 121 has been amended to recite that the flat plate has a flat surface. Support may be found on Page 60 of the Applicants' Specification at Lines 5 – 6. Claim 121 has also been amended to recite the step of moving the table on a paste applicator relative to each other with the moving device in a one time relative movement along the lengthwise direction of the barrier ribs. Support may be found in a number of locations such as on Page 71 at Lines 11 – 12, for example. Further editorial amendments have been made in the preamble to clarify the plasma display substrate.

Claim 127 has been amended to change the distance between the top ends of the barrier ribs and the surface of the flat plate to 0.05 to 0.5 mm. Support may be found on Page 40 at Lines 23 – 24.

The Applicants have also amended Claims 134, 138, 141, 152, and 153 in a manner similar to that set forth above with respect to Claim 121. Finally, Claim 137 has been amended to correct a typographical error. Entry of the above amendments into the official file is respectfully requested.

The Applicants have also added new Claims 154 – 164. New Claim 154 is similar to amended Claim 121 except that reference to the table and moving device has been removed for simplification purposes. New Claim 155 is the same as Claim 140 except that it depends from new Claim 154. New Claim 156 is similar to Claim 154 except that it recites discharging the

phosphor paste for emitting light of red, green and blue as opposed to red, green or blue in the case of Claim 154. Claim 157 is the same as Claim 155 except that it depends on Claim 156. Entry of those new claims into the official file is respectfully requested.

New Claims 158, 159 and 160 are fundamentally modeled on original Claims 1, 2 and 33, respectively. However, they have been changed to recite that the number of outlet holes is 600 to 2000. They also recite that the paste applicator is positioned above the substrate which is readily seen in various of the figures such as in Fig. 1. They further state that the paste flows downwardly from the outlet holes to the substrate. This is also shown in various of the figures. Entry into the official file is respectfully requested.

With respect to Claims 158, 159 and 160, the Applicants also enclose a set of tables that are similar to the tables previously submitted in the Amendment dated December 3, 2003 and received in the PTO on December 5, 2003. The tables have been supplemented to include the new outlet hole and positioning language in those claims. The tables contain the language from Claims 158-160, language from the Applicants' original JP'713 priority document and language from the Applicants' U.S. application.

The tables demonstrate that Claims 158 – 160 are fully supported by the Applicants' original U.S. application and their JP'713 priority document. Thus, Claims 158-160 are entitled to an effective filing date of December 17, 1996, which is the filing date of JP '713. The Applicants respectfully submit that U.S. Patent 5,921,836 to Nanto is not prior art with respect to those three claims inasmuch as its earliest effective date is January 27, 1997. Therefore, it is not available to form a rejection.

The Applicants have further added new Claims 161 – 164. New Claim 161 is similar to Claim 121. However, Claim 161 specifies applying the phosphor paste discharged from the outlet holes into the spaces between the barrier ribs across the entire base substrate to form the

phosphor layers therein in a single pass. As noted in the Interview Summary Record, this aspect was discussed during the interview. Support for the fact that the barrier ribs extend across the entire base substrate (in addition to extending substantially along the entire base substrate) may be found in the paragraphs spanning Pages 19 and 20 of the Applicants' Specification. That text teaches that the barrier ribs can also be formed by coating the substrate fully with a glass paste. It also teaches that it is preferable that the barrier ribs are formed by fully coating the substrate with a photosensitive glass paste. Once the base substrate is fully coated by the glass paste, the ribs can be formed by removal of a mask, for example, placed on the base substrate prior to fully applying the glass paste. As a practical matter, it is unimportant if the barrier ribs cover every square centimeter of the base substrate. What is important and what is meant by fully coating the base substrate and that the barrier ribs are located across the entire base substrate is that the portion of the base substrate that will act as an active portion of a plasma screen is coated. Thus, if several millimeters or even several centimeters do not contain barrier ribs, it is unimportant since that portion of the base substrate will not be an active portion of the plasma screen.

Claim 161 also recites that the application of the phosphor paste is achieved in a single pass. Support for this portion of the claim may also be found in a number of locations such as in the Applicants' Specification on Page 71 in Example 4. That portion of the Applicants' Specification teaches that the coating was completed by one time of paste applicator movement. In other words, the phosphor layer is deposited in a single pass.

As a practical matter, this collective language means that the phosphor paste is deposited in the barrier ribs in a single pass or a single relative movement of the table with respect to the paste applicator. That single-pass deposition of phosphor paste is all that is necessary to form a working plasma display that extends across the entire "working" portion of the substrate. Whether or not there are a few spaces between several barrier ribs on either end across the

substrate is unimportant and whether the barrier ribs cover every single open space on the base substrate is unimportant. What is meant is that a single paste application occurs across the entire base substrate that will be used to form the effective and active portion of the plasma display substrate. This eliminates the above-mentioned “striping” effect. Entry of Claim 161 into the official file is accordingly respectfully requested.

Claims 162-164 contain similar language. Claim 162 is substantially the same as Claim 134 except that it includes the “across the entire base substrate” and “in a single pass” language. The same applies to Claim 163 which is modeled after Claim 138 and Claim 164 which is modeled after Claim 141. Addition of Claims 162-164 into the official file is respectfully requested.

The Applicants note the rejection of Claims 121 – 123, 125 – 127, 129 – 134, 137, 141, 143 and 147 – 153 under 35 U.S.C. §103 over Nanto. The Applicants respectfully submit that Nanto fails to teach or suggest the subject matter of those claims for the reasons set forth below.

The Applicants note with appreciation the Examiner’s detailed comments hypothetically applying Nanto to those rejected claims. For example, the rejection points out that Nanto “explicitly teaches that there may be 5 – 30 nozzles in Column 4 at Lines 26 – 39”. The Applicants agree. The problem there is that the above-mentioned rejected claims recite 150 to 2000 outlet holes. Therefore, Nanto fails to disclose the claimed number of outlet holes.

The rejection relies on the proposition that it would have been obvious to one of ordinary skill in the art at the time the invention was made to add more nozzles to have decreased processing time. The Applicants respectfully submit that Nanto does not disclose, teach or suggest this. In fact, the Applicants respectfully submit that Nanto teaches something quite different. The Applicants respectfully submit that Nanto actually teaches that it is quite difficult to use a plurality of nozzles such as even the 5-30 nozzles explicitly disclosed.

The Applicants invite the Examiner's attention to Column 12 beginning at Line 30 wherein Nanto explicitly states:

...when the coating operation is carried out simultaneously with a plurality of nozzles 56a, it is difficult to apply the fluorescent paste uniformly and accurately into the groove corresponding to each nozzle if the end surface of the tip of the nozzle is perpendicular to the axis of the nozzle, even though the pitch of the nozzle is let to coincide with the rib pitch with high precision. This is because the fluorescent paste can not be easily ejected immediately under the tip of the nozzle due to the viscosity and the surface tension of the fluorescent paste.

The Applicants respectfully submit that this is a serious warning to those skilled in the art that there are problems associated with utilizing an allegedly "obvious" plurality or a multiplicity of nozzles. Thus, even if one skilled in the art were to have taken the affirmative step to "try" to use a plurality of nozzles, one skilled in the art would readily glean from Nanto that there would be difficulties associated with the "trying" of a plurality of nozzles. In other words, those skilled in the art are warned by Nanto that just using a plurality of nozzles to decrease the processing time as hypothetically set forth in the rejection would not likely work.

Nanto was forced to make further modifications to have any real hope that utilizing a plurality of nozzles would work. The solution was to take an additional step of having each of the end surfaces of the nozzles formed at an acute angle relative to the axis of the nozzle. This is shown in Fig. 19 of Nanto and described in Nanto at Column 12, beginning at Line 40.

The second modifications made by Nanto are, of course, in addition to the "obvious" increase in the number of nozzles, despite the teachings that having a plurality or multiplicity of nozzles is actually quite difficult. This does not, however, take into consideration that the Applicants' claimed number of nozzles/outlet holes is, at a minimum, 5 times greater than the highest number of disclosed Nanto nozzles. On the other hand, the number of nozzles/outlet holes recited in the above-mentioned rejected claims can range up to more than 65 times the

maximum number of nozzles disclosed by Nanto.

The Applicants respectfully submit that the disclosure of Nanto in no way suggests increasing the number of nozzles beyond 5-30 in the first place, but in any event, there are no teachings or suggestions to increase the number of nozzles by between 5 to more than 65 times the maximum number of Nanto nozzles. Given the extremely close tolerances required for processes of this type, the Applicants respectfully submit that one skilled in the art would have no reasonable expectation that increasing the number of nozzles by a minimum of 5 times and up to more than 65 times would have a reasonable expectation of success. To the contrary, the Applicants respectfully submit that one skilled in the art would have a reasonable expectation of failure given the warnings and experience of Nanto.

The result of one skilled in the art looking at Nanto would at best be that it would be nothing more than “obvious to try” a plurality of nozzles. Of course, the “obvious to try” standard has long ago been banned by the Federal Circuit. The Applicants respectfully submit, however, that Nanto does not even rise to the level of “obvious to try” because they explicitly warn those skilled in the art that merely utilizing a plurality of nozzles will not likely be successful. Instead, Nanto took an additional step and discovered that positioning the nozzles at an acute angle relative to the axis of the nozzle is the only way that, in their experience, a plurality of nozzles will succeed.

The Applicants do not need to employ the acute angle taught by the additional step taken by Nanto. Instead, the Applicants discovered that utilizing the methodology and/or apparatus recited in the above-mentioned rejected claims, excellent results can be obtained. This is quite surprising in view of the explicitly taught difficulties associated with using a plurality of nozzles as recited by Nanto. The Applicants, therefore, respectfully submit that Nanto leads one skilled in the art away from the subject matter of the above-mentioned rejected claims and that the

Applicants proceeded in a different direction to achieve success. There is nothing more non-obvious than doing something different from what the prior art teaches. That is exactly what the Applicants have done with respect to the above-mentioned rejected claims. The Applicants, therefore, respectfully submit that Nanto is inapplicable and respectfully requests withdrawal of that rejection.

There is another serious problem with Nanto. The above-mentioned rejected claims specifically recite that the paste applicator and table are moved relative to each other with the moving device in a one time relative movement along the lengthwise direction of the barrier ribs. Those claims also specifically recite, such as set forth in Claim 121, applying the phosphor paste discharged from the outlet holes into the spaces between the barrier ribs to form the phosphor layers therein during the one time relative movement. In other words, the Applicants are able to apply the phosphor paste in a single pass through 150 to 2000 outlet holes.

The Applicants respectfully submit that Nanto fails to disclose, teach or suggest this. In sharp contrast, Nanto teaches a multiplicity of passes to apply the paste. Such teachings can be seen throughout the Nanto disclosure and are even illustrated in Fig. 6 wherein an elaborate logic diagram is provided to show/demonstrate the way to perform the multiple passes. The teachings in Nanto that relate to the "check step" in the Nanto process reveals that Nanto only contemplated multiple pass application of paste and in no way considered a single pass process (or apparatus) as achieved by the Applicants by virtue of the claimed one time relative movement as set forth in Claim 121.

The Applicants respectfully submit that this inherently means that Nanto was completely unaware of the advantageous effect of a single-pass coating. The effect of such single-pass coating was previously set forth in Mr. Iguchi's Declaration submitted on October 24, 2005, convenience copy enclosed. That advantageous effect solves the problem that the surface of the

substrate produced by multi-pass coating differs in appearance among the consecutively coated surface areas. That effect is very important because whether a difference of appearance exists or not is an important consideration with respect to the ultimate quality of the display. This was something not at all contemplated by Nanto.

As noted above during the interview, the Applicants demonstrated the surprising differences between a substrate formed by a multi-pass method compared to a substrate formed by a single pass method. The multi-pass method is the method taught by Nanto where a nozzle with a limited number of outlet holes is employed to apply paste in the spaces between the barrier ribs in a multiplicity of passes of the paste applicator. This results in the above-mentioned observable defects in the screen due to the cyclic nature which highlights imperfections in the application of paste.

In sharp contrast, the single pass method is the method that applies to Claims 121-123, 125-127, 129-134, 137, 141, 143, and 147-153. That methodology applies the paste to the spaces in a one time relative movement. In an effort to further clarify this aspect of those rejected claims, the Applicants have amended Claims 121, 134, 138, 141, 152 and 153. Those claims now recite the aspect of applying the phosphor paste discharged from the outlet holes into the spaces between “substantially all of” the barrier ribs to form the phosphor layers therein during the one time relative movement. As noted above, support for the “one time” relative movement may be found in the Applicants’ Specification on Page 71 in Example 4, for example. The “substantially all of” language is supported not only in Example 4, but also in various examples such as Examples 8, 9, and 10.

In that regard, the Applicants invite the Examiner’s attention to Pages 73 and 74. In that case, a base substrate having 2000 barrier ribs was formed. Then, a paste applicator with 640 outlet holes was used to apply red paste. This was done in a single pass. Then, a separate paste

applicator with 640 holes was used to apply green phosphor paste between spaces in the barrier ribs in a single pass. This was followed by a separate paste applicator having 640 holes applying blue phosphor paste into spaces between the barrier ribs in a single pass. It is readily understood by one skilled in the art that the red, green and blue phosphor pastes were applied in a single pass, respectively, by virtue of the existence of 2000 barrier ribs and the deposition of red, green and blue phosphor into 640 outlet holes, respectively, which totals 1,920 spaces between the 2000 barrier ribs. That single-pass application for each of the three pastes left a mere 80 barrier ribs, which clearly would not be filled with any type of paste in a subsequent pass inasmuch as there would be a far excess of outlet holes in the paste applicator. Thus, those few remaining spaces would remain unfilled and would not be utilized as an active and operative portion of the substrate. In any event, it is apparent to one skilled in the art from a fair reading of that example that each of the red, green and blue phosphor pastes were applied in a single pass to “substantially all of” the spaces between the barrier ribs.

The Applicants also invite the Examiner’s attention to Pages 74 and 75 of the Applicants’ Specification to Example 9 wherein all three of the red, blue and green phosphor pastes were applied simultaneously, i.e., in a single pass. In that case, there were again 2000 barrier ribs. However, a paste applicator with 1,940 outlet holes was used and all three of the red, blue and green phosphor pastes were “simultaneously” applied. This left a mere 60 spaces between barrier ribs unfilled---30 on each end. Again, this supports the Applicants’ “substantially all of” language. Thus, the Applicants’ Specification readily supports the language wherein the phosphor paste is discharged from the outlet holes into the spaces between substantially all of the barrier ribs to form the phosphor layers during the one time relative movement. Again, what is important is that a one time relative movement or single pass of the paste applicator is employed. It is not important that every single space between every barrier rib be filled, but that all of the

operative spaces be filled in a one time relative movement.

As demonstrated in the interview, the single-pass methodology and apparatus of Claims 121-123, 125-127, 129-134, 137, 141, 143 and 147-153 readily distinguishes over Nanto. The Nanto multi-pass methodology results in the easily seen cyclic phenomenon of “striping” which is nonexistent in the single-pass method of Claims 121-123, 125-127, 129-134, 137, 141, 143 and 147-153. The Applicants therefore respectfully submit that this is still further evidence of the complete non-obviousness of Claims 121-123, 125-127, 129-134, 137, 141, 143 and 147-153. The Applicants respectfully request withdrawal of the rejection of those claims based on Nanto.

The Applicants note the rejection of Claims 124 and 142 over the hypothetical combination of Ravi-Chandar with Nanto, the rejection of Claims 128 and 146 over the hypothetical combination Mettenbrink with Nanto, the rejection of Claim 131 over the hypothetical combination of Osaka with Nanto, the rejection of Claims 134 – 138 and 152 – 153 over the hypothetical combination of Koike with Nanto, the rejection of Claim 139 under 35 U.S.C. §103 over the hypothetical combination of Silverbrook and Koike with Nanto, the rejection of Claim 140 under 35 U.S.C. §103 over the hypothetical combination of Kohli with Nanto, and the rejection of Claims 144 and 145 over the hypothetical combination of Silverbrook with Nanto. The Applicants respectfully submit that hypothetically combining the secondary and tertiary references with Nanto would still fail to cure the deficiencies set forth above with respect to the Nanto teachings.

Therefore, the Applicants respectfully submit that the various hypothetical combinations would still fail to disclose, teach or suggest the subject matter of the claims mentioned in those various rejections. Withdrawal of all of the rejections is therefore respectfully requested.

Respectfully submitted,



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